
Software maintenance tools

Diagnostic programs

Note: See “Options 51C, 61C, 81, and 81C features” on page 47 for information specific to option 61C, 81 and 81C.

Diagnostic software programs monitor system operations, detect faults, and clear faults. Some programs run continuously; some are scheduled.

Diagnostic programs are *resident* or *non-resident*. Resident programs, such as the Error Monitor and Resident Trunk Diagnostic, are always present in system memory. Non-resident programs, such as the Input/Output Diagnostic and Common Equipment Diagnostic, are used as Midnight and Background Routines or for interactive diagnostics. Non-resident programs are loaded from the system disk and are run as scheduled or upon request.

Non-resident programs are called overlay programs or loads. They are identified by a title and a number preceded by the mnemonic for load (for example, Trunk Diagnostic—LD 36).

See the *X11 input/output guide* (553-3001-400) for detailed information on all diagnostic programs.

Error Monitor

The Error Monitor is a resident program that continuously tracks call processing. The Error Monitor generates system messages if it detects invalid or incorrectly formatted call-processing information.

System messages generated by the Error Monitor are preceded by the mnemonic ERR, which usually indicates hardware faults, or the mnemonic BUG, which usually indicates software problems. With prompt ERRM in the Configuration Record (LD 17), you can instruct the system to print or not print ERR or BUG messages.

Refer to the *X11 system messages guide* (553-3001-411) for help in interpreting system messages, including ERR and BUG.

Initialize Program

The Initialize Program momentarily interrupts call processing as it clears common equipment faults. It then rebuilds call-dependent data and generates system messages, with the mnemonic INI, that indicate the status of the system. This process is called an *initialization*..

Through an initialization, you can download firmware from the CPU to superloop network cards and controller cards. Call processing is interrupted for an additional amount of time during this process.

You can activate an initialization by pressing the manual initialize (Man Int) button on the following:

- NT8D19 Memory/Peripheral Signaling Card in options 21A and 21
- NTND01 ICM Card in option 21E
- QPC580 CPU Interface Card in options 51, 61, and 71
- NT6D66 CP Card or NT9D19 CP Card in options 51C, 61C, 81, and 81C

An initialization always occurs automatically after the System Loader program runs. An initialization often occurs when a software or firmware fault is detected and when a common equipment hardware fault is detected.

Midnight and Background Routines

In the Configuration Record (LD 17), you can select the overlay programs that will run in the *Midnight Routine* and *Background Routine*. These routines automatically perform maintenance checks. Programs included in the Midnight Routine are defined with the prompt DROL (derived from “daily routine overlay”). Programs included in the Background Routine are defined with the prompt BKGD.

Note: A memory test must be run once a day on options 21 and 21E. Therefore, the Common Equipment Diagnostic (LD 35) runs as part of the Midnight Routine even if it is not programmed.

The Midnight Routine runs once every 24 hours. This routine is preset to run at midnight when a system is shipped, but you may assign a different time in the Configuration Record. When it is time for the Midnight Routine to start, the system cancels any other program.

The Background Routine runs when no other program is loaded in the overlay area. The programs included in the Background Routine run in sequence repeatedly until the Midnight Routine runs or there is another request to use the overlay area (for example, if you log on to check the status of a circuit card).

You may include the programs listed in Table 6 in Midnight and Background Routines. Your maintenance requirements and the configuration of your system determine the programs you include in Midnight and Background Routines.

Note: Software Audit (LD 44) should always be used in the Background Routine.

Table 6
Programs used in Midnight and Background Routines

Program number	Program function
LD 30	Network and Signaling Diagnostic
LD 32 (Midnight only)	Network and Peripheral Equipment Replacement
LD 33	1.5 Mbyte Remote Peripheral Equipment Diagnostic
LD 34	Tone and Digit Switch and Digitone Receiver
LD 35 (see Note 1)	Common Equipment Diagnostic
LD 36	Trunk Diagnostic 1
LD 37 (see Note 1)	Input/Output Diagnostic
LD 38	Conference Circuit Diagnostic
LD 40	Call Detail Recording Diagnostic
LD 41	Trunk Diagnostic 2
LD 43 (Midnight only)	Data Dump (see Note 2)
LD 44	Software Audit
LD 45	Background Signal and Switching Diagnostic
LD 46	Multifrequency Sender Diagnostic for ANI
LD 60 (Midnight only)	Digital Trunk Interface Diagnostic
LD 61 (Midnight only)	Message Waiting Lamps Reset
Note 1: For option 51C, 61C, 81, and option 81C, use LD 135 instead of LD 35. Use LD 137 and LD 37.	
Note 2: LD 43 will automatically be activated during midnight routines if changes have been made within the past 24 hours.	

Overlay Loader

This resident program locates, loads, and checks all overlay programs. It automatically activates the Midnight and Background Routines. You can load programs manually by entering commands through the system terminal or maintenance telephone. Once the program is loaded, you see the program mnemonic (such as TRK for Trunk Diagnostic) on the system terminal.

You can also use the Overlay Loader to enable, disable, and display the status of the disk drive unit.

Overload Monitor

The system continuously monitors the volume of system messages. If it detects too many error messages from a line or trunk card, the system activates the Overload Monitor program. The Overload Monitor disables the faulty card and generates system messages with the mnemonic OVD.

Refer to the *X11 system messages guide* (553-3001-411) for help in interpreting system messages.

Resident Trunk Diagnostic

This program automatically monitors all trunk calls and records apparent faults on each trunk. If the number of faults on a trunk exceeds the threshold for that trunk, the program generates a system message identifying the trunk and the type of fault.

A failure on a trunk may keep the trunk from detecting incoming calls. The threshold mechanism cannot detect such a failure, so this program also records how many days it has been since each trunk received an incoming call. If you suspect some incoming calls are not being processed, you can use the command LMAX in Trunk Diagnostic 1 (LD 36) to identify the trunk with the maximum idle days.

System Loader

The System Loader program loads all call-processing programs and data and starts memory-checking diagnostics. After all required programs and data have been loaded and all checks performed, the System Loader is erased from system memory, the Initialize Program runs, and normal call processing begins. This process is called a *sysload* or *system reload*.

The System Loader operates automatically on system power up or if a common equipment or power fault destroys information in the system memory. For maintenance purposes, you generally activate this program only if call processing has stopped.

You can start a sysload manually by pressing the reload (Rld) button on the following:

- QPC687 CPU Card in options 21A and 21
- NTND01 ICM Card in option 21E
- NTND10 (or QPC581) CMA Card in options 51, 61, and 71 (simultaneously press both buttons in options 61 and 71)
- NT6D66 CP Card or NT9D19 CP Card in options 51C, 61C, 81, and 81C (simultaneously press both buttons)

Note: The system loses the time and date during a sysload (except on option 61C, 81, and 81C). You should reset the time and date using LD02.

CAUTION

During a sysload active calls are disconnected and the system goes into an emergency line transfer state. Activate the System Loader only if you are specifically instructed to do so in Northern Telecom Publications.

To minimize sysload time, you can enable the Short Memory Test capability in LD 17 (prompt SMEM). If you enable the test, only one pass of memory testing is performed on a normal reload. If any subsequent system failure causes an automatic reload, the full six-pass Memory Test is performed on all system memory.

Note: A sysload completes so quickly on options 51C, 61C, 81, and option 81C that the Short Memory Test is not useful. Therefore, the package was not designed to be compatible with options 51C, 61C, 81, and 81C.

Options 51C, 61C, 81, and 81C features

When options 51C, 61C, 81, and 81C receive a system reload signal, the sysload occurs in two to five minutes, depending on the size of the customer database. During the sysload, options 51C, 61C, 81, and option 81C perform a core shelf test, which includes self-tests on the CP and the IOP part of the IOP/CMDU. The results of the self-tests are displayed on the liquid crystal display (LCD) on the CP card, the hex display on the IOP/CMDU card, and the system terminal. On the other core cards, the LED blinks three times after a successful test.

Options 51C, 61C, 81, and 81C typically perform an initialization in under 90 seconds. You can manually initialize only the active core side.

In options 51C, 61C, 81, and 81C, the overlays reside in dynamic random access memory (DRAM) after they are loaded from the hard disk during an initial software load (software is shipped on redundant hard disks). Since they are always in resident memory, the overlays can be loaded quickly.

Options 51C, 61C, 81, and 81C can diagnose faults in field replaceable units for all core hardware, including cables. In case of a failure, a message in a natural language (such as English) appears on the system terminal and on the liquid crystal display (LCD) on the CP card.

If there is a hardware fault, the system attempts a recovery. In the case of a redundant hardware failure, under certain conditions options 51C, 61C, and option 81 will attempt a graceful switchover to the core side without the failure.

Options 51C, 61C, 81, and 81C remote operation capabilities include remote access to both Core Modules or Core/Network Modules; the ability to sysload, initialize, or put the system in a split mode; and the ability to upload and download the customer database. You can access the core complex in each Core Module or Core/Network Module through the I/O ports on the CP cards.

The History File feature

If you have a printer connected to the system, each system message is printed as it is received. If you do not have a printer connected, you can use the History File to store a limited number of system messages in protected memory. The contents of the file may then be printed on demand using Print Routine 3 (LD 22).

The messages stored are specified on a system basis and can be one or more of the following types:

- customer service changes (CSC)
- maintenance messages (MTC)
- service changes (SCH)
- software errors (BUG)
- initialization and sysload messages (INI and SYS)
- traffic messages (TRF)

For information on selecting the messages to be stored, see *X11 features and services* (553-3001-305). For help with interpreting system messages, refer to the *X11 system messages guide* (553-3001-411).

The contents of the History File are erased during a sysload or if you change the History File's length. However, because the History File is located in protected data store, the contents survive an initialization.

You can change the length of the History File with the prompt HIST in the Configuration Record (LD 17). The maximum length of the file depends on the amount of protected data store available, which in turn depends on the number of system features that require protected data store.

If the History File is full, the first messages stored are replaced by incoming messages. If this happens, the system gives a "file overflow" message at the start of a printout so you know some information has been replaced by newer messages.

Interactive diagnostics

You can load overlay programs, including programs called *maintenance routines*, into memory through the system terminal or maintenance telephone. This function is performed by the Overload Loader program.

Note: The programs used in Midnight and Background Routines are also used manually as interactive diagnostic programs (see Table 6).

Maintenance routines are used interactively with a command/response format. In this format, you enter a command that tells the system to perform a specific task. The system performs the task and sends system messages indicating the status or errors back to you.

With interactive diagnostics you can do the following:

- disable, test, and enable specific equipment
- verify that a reported fault still needs to be cleared
- verify that a repair procedure has cleared a fault

All maintenance programs and commands are described in detail in the *X11 input/output guide* (553-3001-400). For help with interpreting system messages, refer to the *X11 system messages guide* (553-3001-411).

The Enhanced Maintenance feature

System software sometimes requires modifications, called *patches*, provided by Northern Telecom Technical Assistance Centers. The command ISS in Print Routine 3 (LD 22) prints the software generic and issue. A plus sign (+) by the issue number means a patch is in service.

The Enhanced Maintenance feature does the following:

- allows patches to automatically survive a sysload
- permits patches on non-resident programs
- records all patches in the system
- allows data disks to be shipped with pre-loaded patches

If there is a problem with a patch, the CPU sends system messages with the mnemonic EHM to the system terminal or the History File.

Manual continuity tests

You can perform manual continuity tests on superloop network cards, intelligent peripheral equipment, and Basic Rate Interface (BRI) equipment. A continuity test generates a signaling pattern at one point, monitors its progress, and checks for its detection at an end point. For example, when a superloop network card sends a signal to a controller card, the continuity test verifies the following:

- the superloop network card sent the signal
- the loop carried the signal to the controller card
- the controller card received the signal

In a point-to-point continuity test, a superloop network card or a controller card can generate or detect the test pattern. In loopback tests, one card, a superloop network card, a controller card, or a multi-purpose ISDN signaling processor (MISP) card, is both the generator and the detector. Only idle timeslots are tested in any of the continuity tests.

There are two types of loopback tests for BRI equipment. In one type of test, the pattern generated by the MISP card loops back through the digital subscriber loop (DSL) interface. In the other type of test, the pattern generated by the MISP card loops back through an S/T-interface line card (SILC) or a U-interface line card (UILC), depending on which is specified. Both types of test are accessed as Test 9, but responses to the series of prompts for Test 9 determine the loopback point.

Fifteen continuity tests can run simultaneously. When a test is completed, it stops, the status is reported, and the other tests continue running. You can check the status of any test at any time. When all the tests end, the number of tests run and any failed tests are reported to the CPU. You can display the results at any time during the procedure.

There are nine continuity test configurations. You can run each test by entering a set of prompts outlined in the Background Signaling and Switching Diagnostic (LD 45). Figure 13 shows point-to-point configurations. Figure 14 shows loopback configurations.

Figure 13
Manual continuity tests: point-to-point configurations

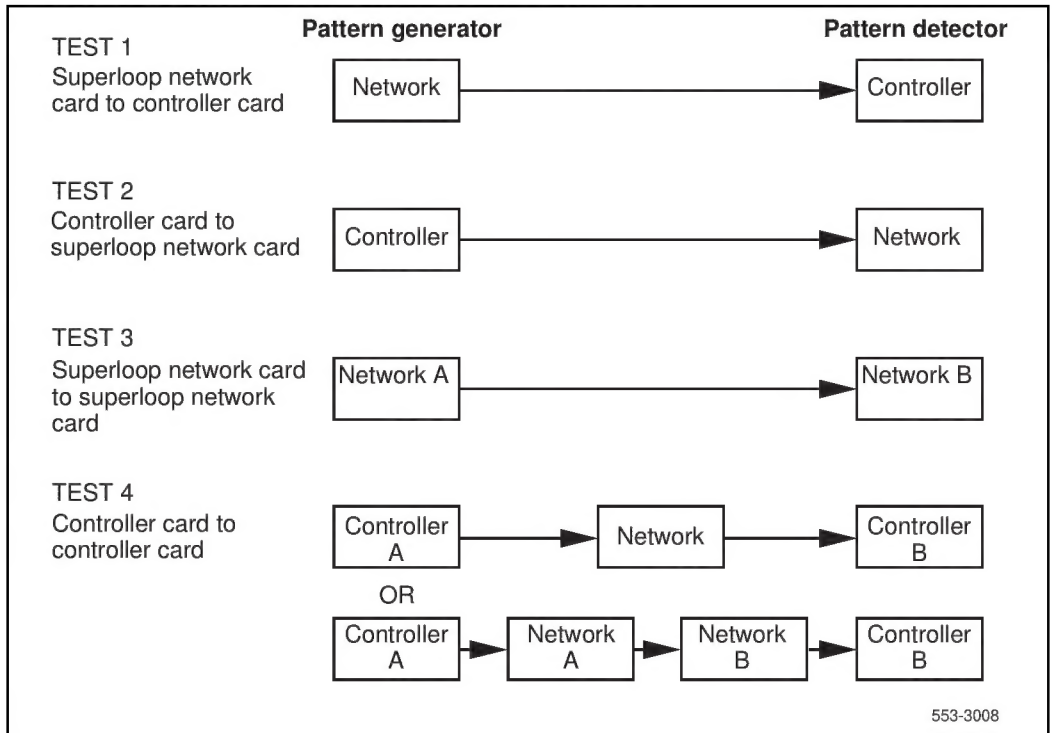


Figure 14
Manual continuity tests: loopback configurations

